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Appraisal of Residential Building Collapse, Causes and Solution in Sokoto State Nigeria.

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Abstract: *A building is said to have failed when some or part of it cannot perform the function expected of it, which means it has reached a limit stage. This research is focused on the causes, and possible solution to residential building failures in Sokoto State. A total of one hundred and nine (109) Questionnaires were administered to selected professionals in building industry; Architects, Town planners, Civil Engineers, Builders and clients in the study area. Also field study of the area to ascertain the failure of some residential houses in some selected Local Governments of the State was carried out.Primary data were obtained from the analysis of the Questions answered by the respondents using statistical package. The research outcome revealed that 72 experts representing 96% indicated that "failure to properly communicate design decisions to the personnel involved in executing them causes building collapse and 3 of the experts representing 4% disagreed and the extent of this difference was contingency coefficient (CC) of 28.50%, P<0.05.And, the most significant cause of building collapse was BQ4 with mean value of 2.96 which could be any (or combination) of these problems: faulty design, poor workmanship and quality materials, and then followed by "Selection of site by the client with mean value of 1.44.However, 69 experts representing 92% indicated that "roof with parapet wall" (RFW) could be the remedial measure/approach to building collapse in Sokoto State to the extents of 32.4%.Common failures seen on poor workmanship, faulty design and quality materials etc proper assurance of competent professionals and strict enforcement of ethical standards by Nigerian society of Engineers, the Nigerian Institute of Builders and the Council for the Regulation of Engineering in Nigeria would reduce the problems identified to the minimum level.To preserve competency and professionalism, professional and regulatory bodies in construction industry should jointly work together to ensure efficiency and sanity in the building industry in Sokoto State.*

Key words: *Collapse, causes, percentages, correlation, standard deviation, degree of freedom.*

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I. Introduction

A. General

Buildings like all structures are designed to serve certain purpose and to support certain loads within its lifespan without excessive deformation. The loads consist of the weight of the people and object, the weight of rain and snow and the wind pressure, these are called live loads and dead loads of building itself.

Building failure has been a calamity globally. Nationally and locally buildings are constructed to serve different purposes i.e. residential, public and commercial fail under serious conditions.

Most building structural failure in the world have occurred under conditions such as settlement or when there is a defect in one or more elements of the building caused by inability of the material making up the components of such building elements to perform its original function effectively, which may finally leads to building collapse. Buildings are meant to provide conveniences and shelter to the people, but the same building has been a danger trap to the same people. Building is expected to meet certain basic requirements such as build ability, quality, safety and timely completion (Olusola, Atta &Ayangade, 2002). The recurring incidence of building collapse some of which claimed innocent lives is a consequence of this.

According to Seld (1975), building fails when the structure or part of it is said to have reached a limit state. Limit state is the state or condition whereby a part of it ceases to perform the function, it is expected to do.

Following each building failure, reviews and changes are made in Engineering methods that were new and had become common or revised and analyzed, but yet non compliance with the stipulated regulations and laxity in the side of professionals have contributed to the continuous occurrence of building failure.

B. Aim of the Study.

The study aimed at examining the causes of residential building collapse in Sokoto State with a view of identifying the causes, effects and solution.

Objectives of the Study

i. To identify the causes of building collapse in Sokoto State
ii. To determine the effects of building collapse in Sokoto State.
iii. To establish remedial measures or approaches to building collapse in Sokoto State

C. **Significance of the Study**

The outcome of this study will educate the general public and the government of the day on the causes, effect and solutions to the cases of building collapse in Sokoto state. This research will also serve as a resource base to other scholars and researchers interested in carrying out further research in this field. Subsequently, if applied will go to an extent to provide new explanation to the topic. Moreover, the research would help assist in saving lives and properties of residential building owners in the state. Furthermore, it would promote professionalism in the building industry in Sokoto state.

D. Scope of the Study

This study on residential building collapse in Sokoto State examines only building collapse cases here in Sokoto State alone, with a view of finding a lasting solution to the issue of building collapse in Sokoto State.

II. Methodology

A. Introduction

The methodology discusses the research design, method of data collection, research instrument, sample and sampling technique, population and method of data presentation and analysis. The research study approach is quantitative. This approach measured the data that was collected by using numerical values which led to the determination of frequencies of occurrence. The instrument used for data collection is a structured questionnaire based on information from the literature on previous surveys. The quantitative data was analyzed using tables, percentages, Mean, SD etc.

B. Research Design

The research design provides the overall strategy that can be chosen to integrate the different components of the study in a coherent and logical way, thereby ensuring effective address to the research problems, it constitutes the blueprint for the collection, measurement, and analysis of data, the study employed a quantitative design approach using survey and relationship between facts and how such facts and relationship accord with theories and the findings of any research executed previously (Fellows and Liu, 1999). The samples collected from quantitative research are often large and representative with scientific techniques used to obtained measurements – quantified data. Analysis of the data yields quantified result and conclusions derived from evaluation of the results in the light of the theory and literature can be generalized to the larger population within acceptance error limits.

A. Method of Data Collection

The data used for the study was generated from primary and secondary source of data collection. Data was collected from some selected local governments of the three senatorial districts that comprise the State. A total number of one hundred and nine (109) questionnaires were distributed to professionals in the building industries in the State. A total number of seventy five (75) questionnaires were returned by the respondents for analysis.

III. Results And Discussion

A. Introduction

Results relating to analyzed data were discussed; there were three main research questions along with their objectives and hypothesis. Each of them were defined and discussed.

B. Sample Characteristics

The first section of the questionnaire sought to obtain demographic information about the respondents. This was to enable comparison among the respondents. Information obtained included gender, year of experience, qualification, profession.

C. Results

AQ: refers as Section A (Question 1, 2, 3…..)
BQ: refers as section B (Question 1, 2, 3……)
DF 1: refers as Degrees of Freedom
DF 2: refers as Degrees of Freedom
Std Dev: refers as Standard Deviation

i. Research Question 1: What are the causes of Building Collapse in Sokoto State.
Objective 1: To identify the causes of building collapse in Sokoto State based on years of experience of the experts.
Hypothesis 1: There is no significant difference among the causes of building collapse in Sokoto State based on years of experience of the experts.

Table 1: Results of causes of Building Collapse in Sokoto State based on years of experience of the experts.

Causes	N	Mean	Std Dev	Df1	DF2	F	P-Value	Remarks
BQ3	75	1.44	0.500	17	57	14.607	0.001	Significant
BQ4	75	2.96	1.006	17	57	5.695	0.001	Significant

Source: Own computation (SPSS.), 2017
A = 0.05, level of significance.

Building collapse in Sokoto State based on years of experience of the experts along with their number of observations (N), mean, standard deviation (std dev.) and other statistics.
For BQ3 and BQ4, respectively the F (7,57) 14.607, $p<0.05$ and $F(7,57) = 5.695$, $p <0.05$ imply that BQ3 and BQ4 are the significant causes of building failure/collapse in Sokoto State. And, the most significant cause of building collapse was BQ4 with mean value of 2.96 which could be any (or combination) of these problems: faulty design, poor workmanship and quality materials, and then followed by "Selection of site by the client with mean value of 1.44.

Therefore, the above results shown that combination (or any) of "faulty design, poor workmanship and quality materials" are the major causes of building collapse followed by the selection of site by the client.

ii. Research Question 2: What are the effects of building collapse in Sokoto State.
Objective 2: To determine the effects of building collapse in Sokoto State based on qualification of the experts.
Hypothesis 2: There is no significant difference in the proportion of effects of building collapse in Sokoto State based on qualification of the experts.
BQ25 % of BQ25 Chi-Sqr Contingency

Table 2a: Results of proportion of effects of building collapse in Sokoto State based on qualification of the experts.

Qualification.	N	Yes	No	Yes	No	Df	Value	Coef.	P-value	Remarks
ND	9	9	0	12	0					
HND	42	42	0	56	0	2	6.64	0.285	0.036	Significant
E. Tech/Eng	24	21	3	28	4					

Source: Own computation (SPSS), 2017
A = 0.05, level of significance

By inspection, Table 2 gives BQ23 as one of the effects of building collapse in Sokoto State along with its number of observations (N) and other statistics based on the experts' qualification. The $X (2) = 6.64$, $P<0.05$ implies that there is significant difference in the proportion of the effects of building collapse in Sokoto State. 72 experts representing 96% indicated that "failure to properly communicate design decisions to the personnel involved in executing them causes building collapse and 3 of the experts representing 4% disagreed and the extent of this difference was contingency coefficient (CC) of 28.50%, $P<0.05$.
Now, the results above suggested that most of the experts seen that failure to properly communicate design decisions to the personnel involved in executing them causes building collapse in Sokoto State to the extent of 28.5%

Table 2b: Results of proportion of effects of building collapse in Sokoto State based on qualification of the experts.

Count BQ26 %BQ26 Chi-Sqr Contingency

Quant.	N	Yes	No	Yes	No	Df	Value	Coef	P-value	Remarks
ND	9	9	0	12	0					
HND	42	23	19	30.7	25.3	2	13.449	0.390	0.001	Significant
E.Tech/Eng	24	7	17	9.3	22.7					

Source: Own Computation (SPSS), 2017
A = 0.05, level of significance

Studying Table 4.2b above, BQ26 was given as one of the effects of building collapse in Sokoto State along with its number of observations (N) and other statistics based on the experts' qualification. The chi-square $[X^2(2)] = 13.449$, $P<0.05$ means that there is significant difference in the proportion of the effects of collapse in Sokoto State. 39 experts representing 52% agreed that building collapse involved deaths" and 36 representing 48% disagreed, and the extent of the difference was contingency coefficient (CC) of 0.390, $p< 0.05$.
Hence, the above results have shown that most of the experts agreed that "building collapse involves deaths" in Sokoto State to the extents of 39%. In general, from the results of table 2b, the most effective building collapse in Sokoto that involved deaths with extent of 39%; then followed by failure with extent of 28.5%.

iii. Research Question 3: What are the remedial measures or approaches to building collapse in Sokoto State.
Objective 3: To identify the remedial measures or approaches to building collapse in Sokoto.
Hypothesis 3: There is no significant difference in the proportion of remedial measures/approaches to building collapse in Sokoto State based on the registration status.

Table 3a: Results of proportion of remedial measures/approaches to building collapse in Sokoto State.

Reg	Count BQ13				%BQ13			Chi-Sqr				
Status	**N**	**P/roof**	**RPW**	**All**	**P/Roof**	**RPW**	**All**	**Df**	**Value**	**CC**	**P-value**	**Significant**
Reg'd	51	0	48	3	0	64	4	2	7.864	0.324	0.020	
Not Reg'd	24	3	21	0	4	28	0					

Source: Own computation (SPSS), 2017
$\alpha = 0.05$

From table 3a above, BQ13 is displayed as one of the remedies/approaches to building collapse in Sokoto State along with its number of observation (N) and other statistics based on experts' registration with professional bodies. The X^2 (2) = 7.864, $P<0.05$, suggests that there is significant difference in the proportion of remedial measures to building collapse. 69 experts representing 92% indicated that "roof with parapet wall" (RFW) could be the remedial measure/approach to building collapse in Sokoto State to the extents of 32.4%.
Therefore, the results above indicate that the remedial measure/approach to building collapse in Sokoto State is RPW to the extent of 32.4%.

Table 3b: Results of proportion of remedial measures/approaches to building collapse in Sokoto state

Reg	Count BQ16				%BQ16			Chi-Sqr				
Status	**N**	**AR**	**HP**	**EP**	**AR**	**HP**	**EP**	**Df**	**Value**	**CC**	**P-value**	**Significant**
Reg'd	51	0	12	39	0	16	52	2	13.973	0.396	0.001	
Not Reg'd	24	6	5	13	8	6.7	17.3					

Source: Own computation (SPSS), 2017
$\alpha = 0.05$, level of significant

From Table 3b above, BQ16 is given as one of the remedial measures/approaches to building collapse in Sokoto State along its number of observations (N) and other statistics based experts' registration status. The X^2 (2) = 13.973, $P<0.05$ means that there is significant difference in the proportion of remedial measure to building collapse in Sokoto State. 52 experts representing 69.3% suggested that epoxy" could be a remedial measure/approach of 39.6%, while others suggested otherwise.
In general, from the results of table 3a and table 3b the most remedial measure/approach to building collapse in Sokoto State was "Epoxy" with extent of 39.6%, and then followed by RPW with extent of 32.4%.

IV. Conclusion

A. Introduction

It is all known to everyone that failure of residential building affect the economy of the State. Government set aside substantial amount in the budget for the construction of houses to its civil servants at subsidized price, construct many but with lower quality due to low quality materials used by the contractors. The rate at which residential buildings fail in Sokoto State reduced to certain level this is because a lot of research has been done and most of the historic structures that lived thousand years are demolished and the Government now started using standard construction companies for the construction of houses unlike previously that it uses local contractors.

B. Conclusion

This research found out that 72 experts representing 96% indicated that failure to communicate design decision to the personnel involved in executing them causes building collapse, also the combination of poor workmanship, faulty design and quality materials followed by selection of site by the client with mean value of 1.44 are the main causes of building collapse in Sokoto State.

There is no doubt that significant progress has been achieved in reducing the rate at which building collapse in Sokoto State. In order to maintain a structure to perform its expected functions, maintenance culture should be adopted by enforcement of regulatory rules guiding the maintenance of building in order to safeguard it from future failure.

Also in order to improve the standard of living of many residential buildings in Sokoto State there is need for upgrading without giving due consideration of earlier structural designs to extend their economic life; cracks, column bending, beams and slabs sagging were it exist on such structures. The following facts were obtained from the study.

1. Clients tend to save cost by using low quality materials, employing services of quacks or incompetent professionals in building.
2. Quacks or non professionals have taken the services of Architects and Engineers in building construction leading to erection of defective buildings.

C. Recommendations

Based on the findings of this survey, the following are recommended.

1. Due to the high cost of modern building materials, Sokoto residents employed the use of local methods and materials which have no code, such should be discouraged.
2. The load bearing walls should be constructed well with adequate strength to withstand the applied loads.
3. Building approval should be granted by the concerned authorities before any building structure is erected.
4. Building Contractors should avoid employing quacks engineers to supervise projects, and compliance to design specification must be adhered to in order to avoid structural failure.
5. To preserve competency and professionalism, professional and regulatory bodies in construction industry should jointly work together to ensure efficiency and sanity in the building industry in Sokoto State.

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APPENDIX I

Correlations OBJ1

		AQ2	AQ3	***AQ4***
AQ2	Pearson Correlation	1	-.172	-.352**
	Sig. (2-tailed)		.141	.002
	N	75	75	75
AQ3	Pearson Correlation	-.172	1	-.003
	Sig. (2-tailed)	.141		.980
	N	75	75	75
AQ4	Pearson Correlation	-.352**	-.003	1
	Sig. (2-tailed)	.002	.980	
	N	75	75	75
BQ1	***Pearson Correlation***	.030	-.176	***.630****
	Sig. (2-tailed)	.801	.130	***.000***
	N	75	75	***75***
BQ3	***Pearson Correlation***	.187	-.032	***.331****
	Sig. (2-tailed)	.108	.784	***.004***
	N	75	75	***75***
BQ4	***Pearson Correlation***	.076	-.087	***-.253****
	Sig. (2-tailed)	.517	.458	***.029***
	N	***75***	***75***	***75***
BQ5	Pearson Correlation	-.060	-.293*	-.050
	Sig. (2-tailed)	.609	.011	.670
	N	75	75	75
BQ6	Pearson Correlation	.183	.299**	.110
	Sig. (2-tailed)	.117	.009	.348
	N	75	75	75
BQ7	***Pearson Correlation***	.300**	.346**	***-.309****
	Sig. (2-tailed)	.009	.002	***.007***
	N	75	75	***75***
BQ9	Pearson Correlation	-.387**	-.140	.021
	Sig. (2-tailed)	.001	.231	.861
	N	75	75	75
BQ10	Pearson Correlation	.020	.123	.021
	Sig. (2-tailed)	.867	.294	.857
	N	75	75	75

		AQ2	AQ3	AQ4
BQ11	Pearson Correlation	-.286	-.281	.122**
	Sig. (2-tailed)	.013	.015	.297
	N	75	75	75
BQ15	Pearson Correlation	-.148	.092	-.409
	Sig. (2-tailed)	.205	.434	.000
	N	75	75	75
BQ17	Pearson Correlation	.300**	.346	-.309
	Sig. (2-tailed)	.009	.002	.007
	N	75	75	75
BQ21	Pearson Correlation	-.035	.031	-.205**
	Sig. (2-tailed)	.765	.793	.077
	N	75	75	75

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

NPar Tests

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
AQ4	75	11.2800	7.18023	2.00	25.00

One-Sample Kolmogorov-Smirnov Test

		AQ4
N		75
Normal Parameters[a,b]	Mean	11.2800
	Std. Deviation	7.18023
Most Extreme Differences	Absolute	.169
	Positive	.169

	Negative	-.101
Kolmogorov-Smirnov Z		1.463
Asymp. Sig. (2-tailed)		.028

a. Test distribution is Normal.
b. Calculated from data.

Graph

Oneway

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
BQ1	.[a]	16	.	.
BQ3	12.815[b]	16	57	.000
BQ4	10.136[c]	16	57	.000
BQ7	.[d]	16	.	.
BQ15	.[e]	16	.	.
BQ17	.[f]	16	.	.

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
	Between Groups	74.747	17	4.397	.	.
BQ1	Within Groups	.000	57	.000		
	Total	74.747	74			
	Between Groups	15.030	***17***	***.884***	***14.607***	***.001***
BQ3	Within Groups	3.450	***57***	***.061***		
	Total	18.480	***74***			
	Between Groups	47.130	***17***	***2.772***	***5.695***	***.001***
BQ4	Within Groups	27.750	***57***	***.487***		
	Total	74.880	***74***			
	Between Groups	3.787	17	.223	.	.
BQ7	Within Groups	.000	57	.000		
	Total	3.787	74			
	Between Groups	74.667	17	4.392	.	.
BQ15	Within Groups	.000	57	.000		
	Total	74.667	74			
	Between Groups	3.787	17	.223	.	.
BQ17	Within Groups	.000	57	.000		
	Total	3.787	74			

Correlations OBJ2

		AQ2	AQ3	AQ4
AQ2	Pearson Correlation	1	-.172	-.352**
	Sig. (2-tailed)		.141	.002
	N	75	75	75
AQ3	Pearson Correlation	-.172	1	-.003
	Sig. (2-tailed)	.141		.980
	N	75	75	75
AQ4	Pearson Correlation	-.352**	-.003	1
	Sig. (2-tailed)	.002	.980	
	N	75	75	75
BQ2	Pearson Correlation	-.184	-.431**	-.108
	Sig. (2-tailed)	.114	.000	.358
	N	75	75	75
BQ14	Pearson Correlation	-.027	.102	.156
	Sig. (2-tailed)	.815	.385	.180
	N	75	75	75
BQ24	Pearson Correlation	-.091	.000	-.312**
	Sig. (2-tailed)	.437	1.000	.006
	N	75	75	75
BQ25	***Pearson Correlation***	***.258****	***-.140***	***.250****
	Sig. (2-tailed)	***.025***	***.231***	***.031***
	N	***75***	***75***	***75***
BQ26	***Pearson Correlation***	***.414****	***.199***	***-.247****
	Sig. (2-tailed)	***.000***	***.087***	***.032***
	N	***75***	***75***	***75***
BQ27	Pearson Correlation	.165	-.061	-.600**
	Sig. (2-tailed)	.158	.601	.000
	N	75	75	75

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Crosstabs
AQ2 * BQ25
Crosstab

			BQ25		Total
			1.00	***2.00***	
AQ2	***ND***	Count	9	0	9
		% of Total	12.0%	0.0%	12.0%
	HND	Count	42	0	42
		% of Total	56.0%	0.0%	56.0%
	B. Tech./Eng.	Count	21	3	24
		% of Total	28.0%	4.0%	32.0%
	Total	Count	72	3	75
		% of Total	96.0%	4.0%	100.0%

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	***6.641****	***2***	***.036***
N of Valid Cases	75		

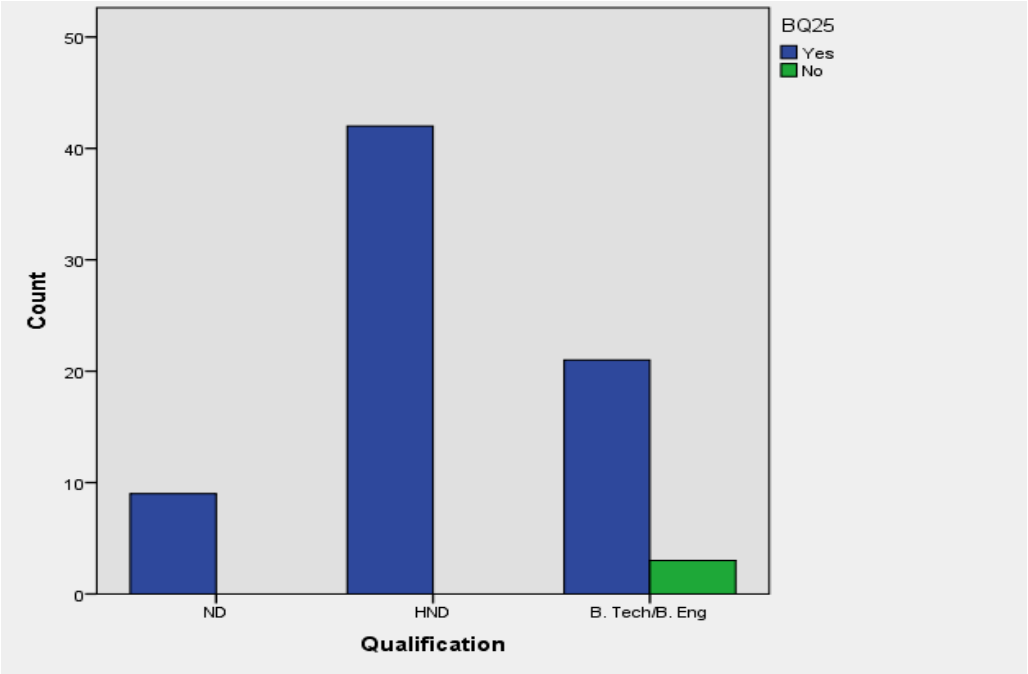
a. 3 cells (50.0%) have expected count less than 5. The minimum expected count is .36.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	**Contingency Coefficient (CC)**	**.285**	**.036**
N of Valid Cases		75	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.



AQ2 * BQ26

Crosstab

			BQ26		Total
			1.00	***2.00***	
AQ2	***ND***	Count	9	0	9
		% of Total	12.0%	0.0%	12.0%
	HND	Count	23	19	42
		% of Total	30.7%	25.3%	56.0%
	B. Tech./Eng.	Count	7	17	24
		% of Total	9.3%	22.7%	32.0%
	Total	Count	39	36	75
		% of Total	52.0%	48.0%	100.0%

Chi-Square Tests

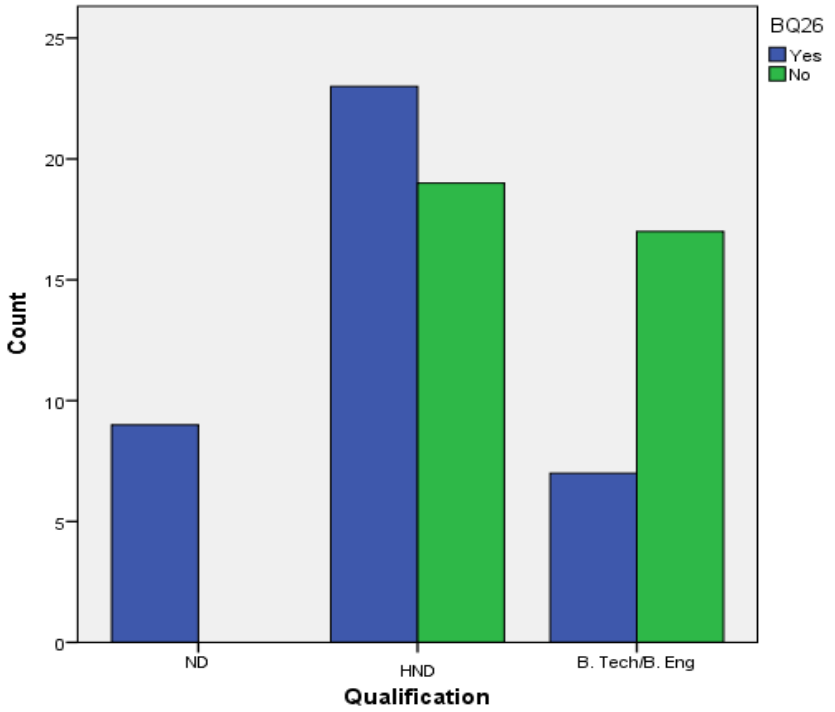
	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	***13.449***[a]	***2***	***.001***
N of Valid Cases	75		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 4.32.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	***Contingency Coefficient (CC)***	***.390***	***.001***
N of Valid Cases		75	

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.



Correlations OBJ3

		AQ2	AQ3	AQ4
AQ2	Pearson Correlation	1	-.172	-.352**
	Sig. (2-tailed)		.141	.002
	N	75	75	75
AQ3	Pearson Correlation	-.172	1	-.003
	Sig. (2-tailed)	.141		.980
	N	75	75	75
AQ4	Pearson Correlation	-.352**	-.003	1
	Sig. (2-tailed)	.002	.980	
	N	75	75	75
BQ8	Pearson Correlation	.254*	-.090	.136
	Sig. (2-tailed)	.028	.441	.246
	N	75	75	75
BQ12	Pearson Correlation	-.319**	.075	.495**
	Sig. (2-tailed)	.005	.524	.000
	N	75	75	75
BQ13	***Pearson Correlation***	***.000***	***-.303****	***.040***
	Sig. (2-tailed)	***1.000***	***.008***	***.736***
	N	***75***	***75***	***75***
BQ16	***Pearson Correlation***	***-.107***	***-.350****	***-.225***
	Sig. (2-tailed)	***.361***	***.002***	***.052***
	N	***75***	***75***	***75***
BQ18	Pearson Correlation	-.065	-.140	.393**
	Sig. (2-tailed)	.582	.231	.000
	N	75	75	75
BQ23	Pearson Correlation	.243*	-.004	-.115
	Sig. (2-tailed)	.036	.972	.324
	N	75	75	75

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Crosstabs
AQ3 * BQ13
Crosstab

			BQ13			Total
			2.00	***3.00***	***4.00***	
AQ3	***Registered***	Count	0	48	3	51

	% of Total	0.0%	64.0%	4.0%	68.0%
Not Registered	Count	3	21	0	24
	% of Total	4.0%	28.0%	0.0%	32.0%
Total	Count	3	69	3	75
	% of Total	4.0%	92.0%	4.0%	100.0%

Chi-Square Tests

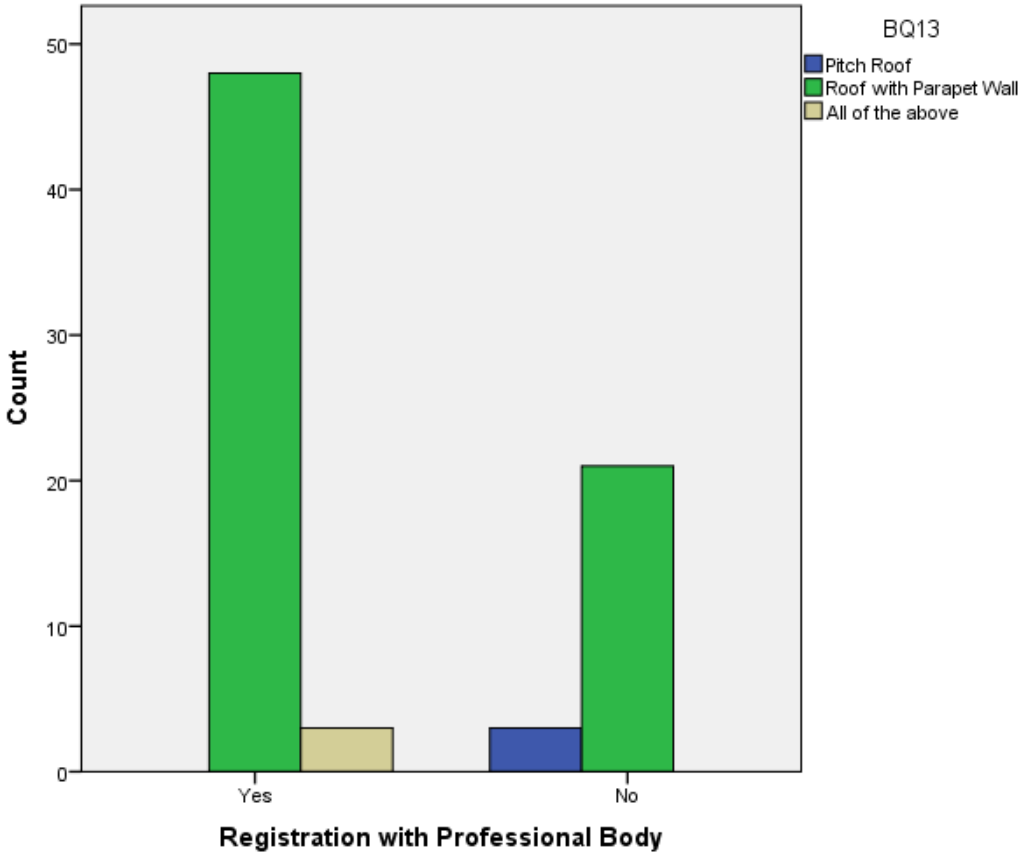
	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	***7.864[a]***	***2***	***.020***
N of Valid Cases	75		

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is .96.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	***Contingency Coefficient (CC)***	***.308***	***.020***
N of Valid Cases		75	

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.



AQ3 * BQ16
Crosstab

			BQ16			Total
			1.00	***2.00***	***3.00***	
AQ3	***Registered***	Count	0	12	39	51
		% of Total	0.0%	16.0%	52.0%	68.0%
	Not Registered	Count	6	5	13	24
		% of Total	8.0%	6.7%	17.3%	32.0%
	Total	Count	6	17	52	75
		% of Total	8.0%	22.7%	69.3%	100.0%

Chi-Square Tests

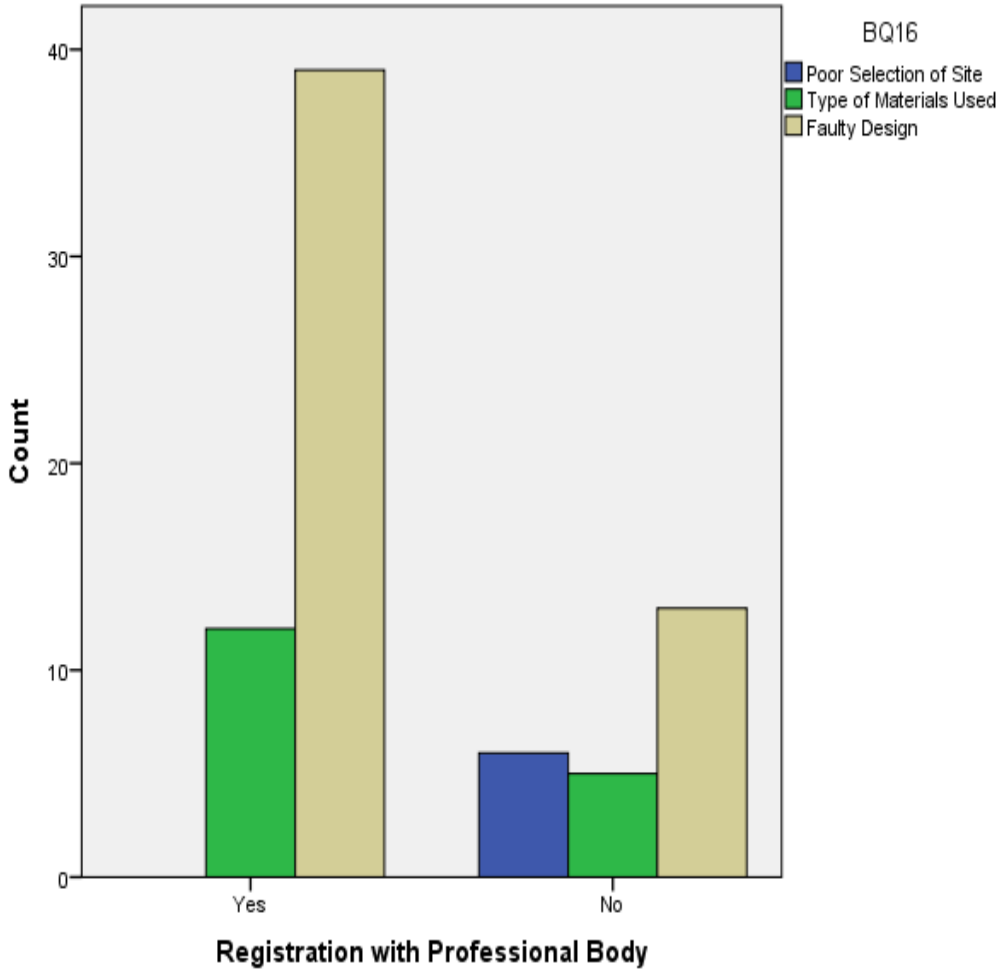
	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	***13.973***[a]	***2***	***.001***
N of Valid Cases	75		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 1.92.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	***Contingency Coefficient***	***.396***	***.001***
N of Valid Cases		75	

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.



APPENDIX II

S_No.	AQ2	AQ3	AQ4	BQ1	BQ2	BQ3	BQ4	BQ5	BQ6	BQ7	BQ8
1	2	2	14	1	4	1	4	1	1	1	2
2	3	1	5	1	4	2	4	3	1	1	1
3	2	2	14	1	4	1	3	1	1	1	2
4	2	1	6	1	4	1	4	1	1	1	1
5	2	2	14	1	4	1	4	1	1	1	1
6	3	1	20	4	2	2	4	3	2	1	2
7	2	1	22	3	4	2	2	1	1	1	3
8	2	1	25	4	2	2	2	1	2	1	2
9	3	2	3	1	1	1	2	1	1	1	2
10	1	2	24	1	1	2	2	1	2	1	1
11	2	1	4	1	4	1	2	3	1	1	2
12	2	2	18	3	4	2	2	1	1	1	2
13	2	1	15	3	4	2	2	1	1	1	2
14	3	2	2	1	1	2	2	1	3	2	2
15	2	1	21	1	4	1	2	1	1	1	2
16	3	1	8	1	4	2	3	1	1	1	2
17	2	1	10	1	4	1	3	1	1	1	2
18	2	1	6	1	4	2	4	1	1	1	2
19	1	2	5	1	4	1	4	1	1	1	2
20	1	1	12	1	4	1	4	4	1	1	1
21	2	1	4	1	4	1	4	1	1	1	1
22	3	1	9	1	4	1	4	1	1	1	2
23	3	1	5	1	4	1	4	1	1	1	2
24	2	1	5	1	4	1	1	1	1	1	2
25	3	1	7	1	4	1	4	1	1	1	2
26	2	2	14	1	4	1	4	1	1	1	1
27	3	1	20	4	2	2	4	3	2	1	2
28	2	1	22	3	4	2	2	1	1	1	3
29	2	1	25	4	2	2	2	1	2	1	2
30	3	2	3	1	1	1	2	1	1	1	2
31	1	2	24	1	1	2	2	1	2	1	1
32	2	1	4	1	4	1	2	3	1	1	2
33	2	2	18	3	4	2	2	1	1	1	2
34	2	1	15	3	4	2	2	1	1	1	2
35	3	2	2	1	1	2	2	1	3	2	2
36	2	1	21	1	4	1	2	1	1	1	2
37	3	1	8	1	4	2	3	1	1	1	2
38	2	1	10	1	4	1	3	1	1	1	2
39	2	1	6	1	4	2	4	1	1	1	2
40	1	2	5	1	4	1	4	1	1	1	2
41	1	1	12	1	4	1	4	4	1	1	1
42	2	1	4	1	4	1	4	1	1	1	1

43	3	1	9	1	4	1	4	1	1	1	2
44	3	1	5	1	4	1	4	1	1	1	2
45	2	1	5	1	4	1	1	1	1	1	2
46	2	2	14	1	4	1	4	1	1	1	2
47	3	1	5	1	4	2	4	3	1	1	1
48	2	2	14	1	4	1	3	1	1	1	2
49	2	1	6	1	4	1	4	1	1	1	1
50	2	2	14	1	4	1	4	1	1	1	1
51	3	1	20	4	2	2	4	3	2	1	2
52	2	1	22	3	4	2	2	1	1	1	3
53	2	1	25	4	2	2	2	1	2	1	2
54	3	2	3	1	1	1	2	1	1	1	2
55	1	2	24	1	1	2	2	1	2	1	1
56	2	1	4	1	4	1	2	3	1	1	2
57	2	2	18	3	4	2	2	1	1	1	2
58	2	1	15	3	4	2	2	1	1	1	2
59	3	2	2	1	1	2	2	1	3	2	2
60	2	1	21	1	4	1	2	1	1	1	2
61	3	1	8	1	4	2	3	1	1	1	2
62	2	1	15	3	4	2	2	1	1	1	2
63	3	2	2	1	1	2	2	1	3	2	2
64	2	1	21	1	4	1	2	1	1	1	2
65	3	1	8	1	4	2	3	1	1	1	2
66	2	1	10	1	4	1	3	1	1	1	2
67	2	1	6	1	4	2	4	1	1	1	2
68	1	2	5	1	4	1	4	1	1	1	2
69	1	1	12	1	4	1	4	4	1	1	1
70	2	1	4	1	4	1	4	1	1	1	1
71	3	1	9	1	4	1	4	1	1	1	2
72	3	1	5	1	4	1	4	1	1	1	2
73	2	1	5	1	4	1	1	1	1	1	2
74	2	2	14	1	4	1	4	1	1	1	2
75	3	1	5	1	4	2	4	3	1	1	1

BQ9	BQ10	BQ11	BQ12	BQ13	BQ14	BQ15	BQ16	BQ17	BQ18
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1	4	1	1	2	2	4	1	1	1

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1	1	4	1	3	1	4	3	1	1
1	1	4	1	3	1	4	3	1	1
1	1	4	1	3	1	4	2	1	1
1	1	4	1	4	1	4	3	1	1

BQ19	BQ20	BQ21	BQ22	BQ23	BQ24	BQ25	BQ26	BQ27
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1	1	3	1	4	4	1	2	2
1	1	3	1	4	4	1	2	2
1	1	3	1	1	1	1	2	2

APPENDIX III
DEPARTMENT OF CIVIL ENGINEERING
UMARU ALI SHINKAFI POLYTECHNIC

This questionnaire is designed by Adamu Yunusa and Bashar Sada, staff of the above named Institution. The research titled "Appraisal of Residential Building Collapse, causes and solution in Sokoto State".

Please kindly contribute your opinion by responding to the questions below. Your cooperation is highly solicited to the success of this research work, your response will be kindly recognized and should be exclusively reserved for academic purpose and also be treated with high confidentiality.

Section "A" Personnel Particulars

1. Name of contractor/employer ……
2. Qualification …….
3. Registered professional body ……
4. Years of working experience …….

Section "B" Questions

1. Which of these is a client's contribution to building failure?
   a. Poor design [ ]
   b. Monetary delay [ ]
   c. Working without approval [ ]
   d. Work variation [ ]
2. Which of the following is to be blamed for the construction of building without seeking for approval?
   a. Client only [ ]
   b. Client, town planners (TP) and engineers [ ]
   c. TP, Engineers and Architect [ ]
   d. Client, TP, Engineers and Architect [ ]
3. Do selection of site by the client causes building failure?
   a. Yes [ ]
   b. No [ ]
4. Which of the following causes of building failure do you think is responsible for failures of building in Sokoto State?
   a. Faulty design [ ]
   b. Poor workmanship [ ]
   c. Quality materials [ ]
   d. All of the above [ ]
5. Building failure in Sokoto State is mostly due to the bad construction of?
   a. Sub-structure [ ]
   b. Super-Structure [ ]
   c. All of the above
6. In your own opinion, which of these do you think is the cause of sub-structure failure in Sokoto State.
   a. Settlement [ ]
   b. Formation Failure [ ]

c. Bad Material [ ]
d. Dampness [ ]

7. Do you believe that failure to carryout site investigation contributes to the building failure in Sokoto State?
   a. Yes [ ]
   b. No [ ]
8. How often is maintenance of building being carried out to rectify building failure in Sokoto State?
   a. Very often [ ]
   b. Often [ ]
   c. Not at all [ ]
9. Failure of regulatory bodies to perform their duty contributes to the building collapse in Sokoto State.
   a. True [ ]
   b. False [ ]
10. Which of the following methods do you consider appropriate for rectification of failure due to substructure problem?
    a. Demolition and reconstruction [ ]
    b. Cutting and rebuilding [ ]
    c. Underpinning [ ]
    d. All of the above [ ]
11. Building collapse in Sokoto State mostly is as a result of?
    a. Poor Supervision/Nor Supervision [ ]
    b. Faulty design [ ]
    c. Bad Material [ ]
    d. All of the above [ ]
12. With modern construction of building, Sokoto State (people) have adopted aesthetic design of building. Do you think it contribute to the collapse of building in the State?
    a. Yes [ ]
    b. No [ ]
13. In order to minimize problems of destruction of roof, by heavy wind storm, what type of roof do you suggest most suitable in Sokoto State?
    a. Flat roof [ ]
    b. Pitch roof [ ]
    c. Roof with parapet wall [ ]
    d. All of the above [ ]
14. How often does cracking contribute to building collapse in Sokoto State?
    a. Very often [ ]
    b. Often [ ]
    c. Not at all [ ]
15. Which of these is the cause of cracking in building?
    a. Poor selection of site [ ]
    b. Type of material used [ ]
    c. Faulty design [ ]
    d. All of the above [ ]
16. Which of these methods best used to prevent cracking?
    a. Additional reinforcement [ ]
    b. Hacking and plaster [ ]
    c. Epoxy [ ]
17. Is Rainstorm among the factors responsible for the building collapse in Sokoto State?
    a. True [ ]
    b. False [ ]
18. Lack of adequate drainages contribute to building collapse in Sokoto State?
    a. True [ ]
    b. False [ ]
19. Do Non-compliance with the engineers and developers in the building industries cause building collapse in Sokoto State?
    a. Yes [ ]
    b. No [ ]
20. Disregard for the building regulations causes building collapse in Sokoto State.
    a. True [ ]

b. False [ ]

21. Which of these encourage poor supervision on site?
    a. Poor communication between engineers and architect [ ]
    b. Poor involvement of engineers in conceptual design and supervision on site [ ]
    c. All of the above [ ]
22. Do lack of professionalism and construction experience causes building collapse?
    a. True [ ]
    b. False [ ]
23. Who among these are responsible for training field inspectors to avoid quacks?
    a. Government [ ]
    b. Professional Bodies [ ]
    c. Contractor [ ]
    d. All of the above [ ]
24. Which of these compromises professionals' ethics that could lead to building collapse?
    a. Engineers [ ]
    b. Contractors [ ]
    c. Regulatory bodies [ ]
    d. All of the above [ ]
25. Failure to properly communicate design decisions to the personnel involved in executing them causes building collapse.
    a. True [ ]
    b. False [ ]
26. Does building collapse in Sokoto State results to deaths?
    a. Yes [ ]
    b. No [ ]
27. Has death ever been recorded in building collapse in Sokoto?
    a. True [ ]
    b. False [ ]

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